

## CLAIMS

We claim:

1. A method of removing arsenic from arsenic-containing water comprising: contacting  
5 said water with a precipitating composition comprising a metal salt hydroxide-gel.
2. The method of claim 1, further comprising separating said water from said precipitating composition.
3. The method of claim 2, wherein said separating is performed using a filter.
4. The method of claim 3, wherein said filter is DE coated on a filter screen or septum  
10 made of water-compatible material.
5. The method of claim 4, wherein said water-compatible material is polyethylene, polypropylene or stainless steel.
6. The method of claim 3, wherein said filter is a DE filter bed.
7. The method of claim 6, wherein said filter is a DE filter bed coated with a metal salt  
15 hydroxide-gel.
8. The method of claim 2, wherein said separating step is performed using DE-assisted settling or DE-assisted centrifuge.
9. The method of claim 2, wherein said separating step is performed using settling or flotation of hydroxide-gels.
- 20 10. The method of claim 1, wherein said metal salt hydroxide-gel is formed prior to contacting said water with said precipitating composition.
11. The method of claim 10, wherein said metal salt hydroxide-gel is formed by adjusting the pH of a solution containing metal salts so that a metal salt hydroxide-gel is formed.
12. The method of claim 1, wherein the pH of the precipitating composition and arsenic-  
25 containing water is adjusted to form a metal salt hydroxide-gel after contacting the precipitating composition and said water.
13. The method of claim 1, wherein said composition is contacted with said arsenic-containing water at a pH from about 2 to about 14.
14. The method of claim 1 wherein said contacting step is performed using a member of  
30 the group consisting of: mechanical mixing, ultrasonic mixing, mixing in-line using an atomizer, mixing in-line using venturi and mixing using metering pumps.
15. A method of removing arsenic from arsenic-containing water comprising: coating DE with one or more metal salt hydroxide-gels to form DE pre-coated hydroxide-gels; and contacting said arsenic-containing water with said DE pre-coated hydroxide-gels.

16. The method of claims 1 or 15, wherein said metal salt hydroxide-gel is formed from at least one member of the group consisting of: lanthanum chloride, lanthanum nitrate, lanthanum carbonate, ferric chloride, ferric sulfate, magnesium chloride, magnesium nitrate, magnesium carbonate, aluminum chloride, aluminum nitrate, aluminum sulfate, and sodium aluminate.
17. The method of claim 16, wherein said precipitating composition comprises more than one different metal salt.
18. The method of claim 1 or 15, wherein said arsenic-containing water contains arsenic at a concentration of about 10 ppb to 100 ppm.
19. The method of claim 18, wherein said arsenic-containing water contains one or more members selected from the group consisting of: arsenite and arsenate.
20. The method of claim 18, wherein said arsenic-containing water comprises one or more members of the group selected from: raw water, well water, drinking water, and process water.
21. The method of claim 1 or 15, wherein said composition is contacted with said arsenic-containing water for a time of between about 1 minute to about 6 minutes at a pH between about 3 and about 12.
22. The method of claim 1 or 15, wherein said metal salt hydroxide-gel comprises lanthanum and iron.
23. The method of claim 1 or 15, wherein said lanthanum and iron are added to said water at weight ratios of between about 1:1 and 1:10 of lanthanum:iron.
24. The method of claim 3, wherein said filter is selected from the group consisting of: diatomaceous earth (DE), cellulose, and perlite.
25. The method of claim 1 or 15, wherein said metal salt hydroxide-gel consists essentially of lanthanum hydroxide.
26. The method of claim 1 or 15, wherein said metal salt hydroxide-gel is a rare earth hydroxide.
27. A method of removing heavy metals from heavy metal-containing solution comprising: contacting said solution with a metal salt hydroxide-gel; and passing said solution through a filter.
28. The method of claim 27, wherein said metal salt hydroxide-gel comprises lanthanum and iron.
29. The method of claim 27, wherein said filter is a DE filter bed.

30. The method of claim 27, wherein said filter is a DE filter bed coated with a metal salt hydroxide-gel.

31. A composition for removing arsenic or heavy metal from arsenic- or heavy metal-containing water comprising: diatomaceous earth, a lanthanum salt and an iron salt.

5 32. The composition of claim 31, wherein said lanthanum salt and iron salt are chlorides.

33. The composition of claim 31, wherein said metal is arsenic.

34. The composition of claim 31, wherein said metal is a heavy metal.

35. A method of using the composition of claim 31, comprising mixing the precipitating composition with arsenic- or heavy metal-containing water and adjusting the pH so that a  
10 metal salt hydroxide-gel is formed.

36. A method of making a DE-coated hydroxide-gel comprising: contacting a precipitating composition with DE; and adjusting the pH to form a DE-coated hydroxide-gel.

37. A method of making a DE-coated hydroxide-gel comprising: contacting metal salts with DE, forming a composition; and aging the composition.

15 38. The method of claim 37, further comprising separating the solid composition from the liquid.

39. The method of claim 37, further comprising contacting arsenic-containing water with the composition; and adjusting the pH of the resulting composition to form a DE-coated hydroxide-gel.